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IS 4511-1 (1986): Methods of Test for Styrene-Butadiene Rubber (SBR) Latices, Part 1: Determination of Dry Polymer Content [PCD 13: Rubber and Rubber Products]



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IS : 4511 (Part 1) - 1986

Indian Standard

METHODS OF TEST FOR
STYRENE-BUTADIENE RUBBER (SBR) LATICES

PART 1 DETERMINATION OF DRY POLYMER CONTENT

SBRL : 1

(*First Revision*)

UDC 678.746.22—136.22 : 543.814



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

*Indian Standard*METHODS OF TEST FOR
STYRENE-BUTADIENE RUBBER (SBR) LATICES

PART 1 DETERMINATION OF DRY POLYMER CONTENT

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(First Revision)

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*Indian Standard*METHODS OF TEST FOR
STYRENE-BUTADIENE RUBBER (SBR) LATICES

PART 1 DETERMINATION OF DRY POLYMER CONTENT

SBRL : 1

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part 1) (First Revision) was adopted by the Indian Standards Institution on 14 February 1986, after the draft finalized by the Rubber Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 Test methods for rubber latex had been originally covered in the following Indian Standards:

For natural rubber latex

IS : 3708 (Part 1)-1966*

IS : 3708 (Part 2)-1968†

For styrene-butadiene rubber latex

IS : 4511 (Part 1)-1967‡

Since some of the test methods covered in these standards were common, the concerned committee had decided to unify and publish a separate series of methods of test which would be applicable to all types of latices — natural as well as synthetic. Accordingly, the following six test methods had been covered in the following different parts of IS : 9316:

IS : 9316 Methods of test for rubber latex:

Part 1-1979 Determination of surface tension

*Methods of test for natural rubber latex: Part 1 Dry rubber content, sludge content, density, total alkalinity, KOH-number, mechanical stability, volatile fatty acid number, pH, total nitrogen, total copper, total iron, total manganese and total ash.

†Methods of test for natural rubber latex: Part 2 Determination of boric acid and magnesium.

‡Methods of tests for styrene-butadiene rubber (SBR) latices: Part 1 Determination of dry polymer, pH, density, residual styrene, bound styrene and soap content.

- Part 2-1979 Determination of viscosity
- Part 3-1979 Determination of coagulum content
- Part 4-1979 Determination of total solids content
- Part 5-1979 Drawing of samples
- Part 6-1982 Determination of ρH

0.2.1 As a result of further rethinking on the subject, it has now been decided to re-designate the test methods common to natural and synthetic rubber latices as RL series; test methods for natural rubber latex as NRL series and test methods for styrene-butadiene rubber latex as SBRL series. Consequently, test methods for rubber latex have been rationalized into the following three series:

- a) IS : 9316 Unified methods of test applicable to both natural and synthetic rubber latices — RL series;
- b) IS : 3708 Methods of test applicable to natural rubber latex — NRL series; and
- c) IS : 4511 Methods of test applicable to styrene-butadiene rubber latex — SBRL series.

0.3 The existing Indian Standards IS : 3708 (Part 1)-1966*, IS : 3708 (Part 2)-1968†, IS : 4511 (Part 1)-1967‡, IS : 9316 (Parts 1 to 5)-1979§ and IS : 9316 (Part 6)-1982|| are being gradually replaced by separate standards under the above three series, designated as NRL, SBRL, or RL series, respectively.

0.3.1 The methods covered under NRL : 13, NRL : 14 and NRL : 15 of IS : 3708 (Part 1)-1966* which are also under revision, have been proposed to be covered under the RL series in IS : 9316 (*under revision*).

0.4 In order to facilitate cross-reference, it has been decided to retain, in the revisions of various parts of IS : 4511, the original discrete SBRL series numbers assigned to various test methods earlier in IS : 4511 (Part 1)-1967‡.

*Methods of test for natural rubber latex: Part 1 Dry rubber content, sludge content, density, total alkalinity, KOH-number, mechanical stability, volatile fatty acid number, ρH , total nitrogen, total copper, total iron, total manganese and total ash.

†Methods of test for natural rubber latex: Part 2 Determination of boric acid and magnesium.

‡Methods of tests for styrene-butadiene rubber (SBR) latices: Part 1 Determination of dry polymer, ρH , density, residual styrene, bound styrene and soap content.

§Methods of test for rubber latex:

- Part 1 Determination of surface tension.
- Part 2 Determination of viscosity.
- Part 3 Determination of coagulum content.
- Part 4 Determination of total solids content.
- Part 5 Drawing of samples.

||Methods of test for rubber latex: Part 6 Determination of ρH .

0.4.1 For proper referencing of the existing test methods and the new methods under revision, a statement showing corresponding methods is given in Appendix A.

0.5 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard (Part 1) prescribes the procedure for determination of dry polymer content of styrene-butadiene rubber latices.

2. OUTLINE OF THE METHOD

2.1 Latex is coagulated by *isopropanol*. The coagulum is refluxed, washed, dried and weighed.

3. APPARATUS

3.1 Air Oven — maintained at $105 \pm 2^{\circ}\text{C}$.

3.2 Desiccator

3.3 Flask — 250-ml or 500-ml capacity with ground glass neck of at least 50 mm diameter.

3.4 Measuring Cylinder — 100-ml capacity.

3.5 Nylon Gauze — 105 microns.

3.6 Reflux Condenser — all glass with ground glass joints.

3.7 Steam Bath

3.8 Watch Glass

3.9 Weighing Bottle with Close Fitting Stopper

4. REAGENT

4.1 *isoPropanol* — conforming to IS : 2631-1976†.

5. PROCEDURE

5.1 Take the sieved original latex in dry prepared (at $105 \pm 2^{\circ}\text{C}$) weighing bottle and transfer 5 to 7 g of latex by difference of mass, to the nearest 1 mg, in a small beaker (100 ml) and dilute it to

*Rules for rounding off numerical values (*revised*).

†Specification for *isopropyl alcohol* (*first revision*).

approximately 25 to 30 percent with distilled water. Pour the diluted latex in thin stream into a flask (500 ml) containing 100 ml of *isopropanol*. Rinse the beaker with distilled water and transfer to the flask. Attach the reflux condenser to the flask and reflux on the steam bath for one hour. Remove the flask from the steam bath and decant the solvent into a beaker covered with fine gauze, taking care that the minimum amount of coagulum is decanted with the solvent. Return any coagulum from the gauze to the flask, add 100 ml of distilled water to the flask and shake vigorously. Decant the water through the same gauze and repeat the procedure with 100 ml of fresh water until no more foam is obtained (three or four washings may be sufficient). Wash the decanted coagulum in the flask with 100 ml solvent and the coagulum into the gauze. Carefully transfer the coagulum to pretared watch glass and dry at $105 \pm 2^{\circ}\text{C}$ in the air oven. Cool in a desiccator to room temperature and weigh. Repeat drying and weighing till the dried mass is constant to 0.000 2 g.

5.2 If duplicate determinations do not agree within 0.2 percent "dry polymer, make additional duplicate determinations until such agreement is obtained.

6. CALCULATION

6.1 Calculate the dry rubber content as follows:

Dry polymer content,

$$\text{percent by mass} = \frac{M_1}{M_2} \times 100$$

where

M_1 = mass in g of dried coagulum, and

M_2 = mass in g of the original latex.

APPENDIX A

(Clause 0.4.1)

TABLE SHOWING CORRESPONDENCE OF VARIOUS METHODS OF TEST COVERED IN THE EXISTING IS : 9316 (PARTS 1 TO 5)-1979, IS : 9316 (PART 6)-1982, IS : 3708 (PART 1)-1966, IS : 3708 (PART 2)-1968, IS : 4511 (PART 1)-1967, WITH THE REVISION/PROPOSED REVISION OF IS : 9316, IS : 3708 AND IS : 4511

EXISTING TEST METHODS			PROPOSED REVISION		REMARKS
Test Method	IS No.	Part (Series)	IS No.	Part (Series)	
(1)	(2)	(3)	(4)	(5)	
<i>RL SERIES</i>					
Determination of surface tension	IS : 9316-1979	Part 1	IS : 9316	Part 1 (RL : 1)	Under revision
Determination of viscosity	IS : 9316-1979	Part 2	IS : 9316	Part 2 (RL : 2)	
Determination of coagulum content	IS : 9316-1979	Part 3	IS : 9316	Part 3 (RL : 3)	
Determination of total solids content	IS : 9316-1979	Part 4	IS : 9316	Part 4 (RL : 4)	
Drawing of samples	IS : 9316-1979	Part 5	IS : 9316	Part 5 (RL : 5)	
Determination of pH	IS : 9316-1982	Part 6	IS : 9316	Part 6 (RL : 6)	
Determination of total copper	IS : 3708-1966	Part 1 (NRL : 13)	IS : 9316	Part 7 (RL : 7)	
Determination of total iron	IS : 3708-1966	Part 1 (NRL : 14)	IS : 9316	Part 8 (RL : 8)	
Determination of total manganese	IS : 3708-1966	Part 1 (NRL : 15)	IS : 9316	Part 9 (RL : 9)	

(Continued)

IS : 4511 (Part 1) - 1986

**TABLE SHOWING CORRESPONDENCE OF VARIOUS METHODS OF
TEST COVERED IN THE EXISTING IS : 9316 (PARTS 1 TO 5)-1979,
IS : 9316 (PART 6)-1982, IS : 3708 (PART 1)-1966, IS : 3708 (PART 2)-
1968, IS : 4511 (PART 1)-1967, WITH THE REVISION/PROPOSED
REVISION OF IS : 9316, IS : 3708 AND IS : 4511 — Contd**

EXISTING TEST METHODS			PROPOSED REVISION		REMARKS
Test Method	IS No.	Part (Series)	IS No.	Part (Series)	
(1)	(2)	(3)	(4)	(5)	(6)
NRL SERIES					
Determination of dry rubber content	IS : 3708-1966	Part 1 (NRL : 1)	IS : 3708-1985	Part 1 (NRL : 1)	
Determination of sludge content	IS : 3708-1966	Part 1 (NRL : 5)	IS : 3708-1985	Part 2 (NRL : 5)	
Determination of density	IS : 3708-1966	Part 1 (NRL : 6)	IS : 3708-1985	Part 3 (NRL : 6)	
Determination of total alkalinity	IS : 3708-1966	Part 1 (NRL : 7)	IS : 3708-1985	Part 4 (NRL : 7)	
Determination of KOH-number	IS : 3708-1966	Part 1 (NRL : 8)	IS : 3708-1985	Part 5 (NRL : 8)	
Determination of mechanical stability	IS : 3708-1966	Part 1 (NRL : 9)	IS : 3708-1985	Part 6 (NRL : 9)	
Determination of volatile fatty acid number	IS : 3708-1966	Part 1 (NRL : 10)	IS : 3708-1985	Part 7 (NRL : 10)	
Determination of total nitrogen	IS : 3708-1966	Part 1 (NRL : 12)	IS : 3708-1985	Part 8 (NRL : 12)	
Determination of total ash	IS : 3708-1966	Part 1 (NRL : 16)	IS : 3708-1985	Part 9 (NRL : 16)	

Determination of boric acid IS : 3708-1968 Part 2 (NRL : 17) IS : 3708 Part 10 (NRL : 17)

Determination of magnesium IS : 3708-1968 Part 2 (NRL : 18) IS : 3708 Part 11 (NRL : 18)

SBRL SERIES

Determination of dry polymer IS : 4511-1967 Part 1 (SBRL : 1) IS : 4511 Part 1 (SBRL : 1)

Determination of density IS : 4511-1967 Part 1 (SBRL : 6) IS : 4511 Part 2 (SBRL : 6)

Determination of residual styrene (volatile unsaturates) IS : 4511-1967 Part 1 (SBRL : 8) IS : 4511 Part 3 (SBRL : 8) Under Revision

Determination of bound styrene IS : 4511-1967 Part 1 (SBRL : 9) IS : 4511 Part 4 (SBRL : 9)

Determination of soap content IS : 4511-1967 Part 1 (SBRL : 10) IS : 4511 Part 5 (SBRL : 10) Under Revision

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DR N. M. MATHEW (<i>Alternate</i>)	



INDIAN STANDARDS INSTITUTION

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 331 0131 331 1375

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices:

Telephone

*Western : Manakalaya, E9 MIDC, Marol Andheri (East) 6 32 92 95
BOMBAY 400093

†Eastern : 1/14 C. I. T. Scheme VII M. V. I. P. Road, 36 24 99
Maniktola, CALCUTTA 700054

Northern : SCO 445-446, Sector 35-C { 2 18 43
CHANDIGARH 160036 { 3 16 41

Southern : C. I. T. Campus, MADRAS 600113 { 41 24 42
{ 41 25 19
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BANGALORE 560002

Gangotri Complex, 5th Floor, Bhadbhada Road, 6 67 16
T. T. Nagar, BHOPAL 462003

Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002 6 36 27

53/5 Ward No. 29, R. G. Barua Road, 5th Byelane, —
GUWAHATI 781003

6-8-56C L. N. Gupta Marg, HYDERABAD 500001 22 10 83

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{ 6 98 32

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